

# EXHIBIT E

## Longfin Smelt Risk Assessment Matrix (LSRAM)

January 31, 2008

Triggers	December	January	February	March	April	May	June	July
Life Stage	Adults	Adults and Larvae	Adults and Larvae	Larvae	Larvae and Juveniles	Larvae and Juveniles	Juveniles	Juveniles
Previous Two Year's Fall Midwater Trawl <b>Concern Index Level (1)</b>	Index below 240 for one or both years	Index below 240 for one or both years	Index below 240 for one or both years	Index below 240 for one or both years	Index below 240 for one or both years	Index below 240 for one or both years	Index below 240 for one or both years	Index below 240 for one or both years
Risk of Entrainment (2)	X2 upstream of Chipps Island; reduced if Sac R. flows >80k cfs	X2 upstream of Chipps Island; reduced if Sac R. flows >80k cfs	X2 upstream of Chipps Island; reduced if Sac R. flows >80k cfs	X2 upstream of Chipps Island ; reduced if Sac R. flows >80k cfs	X2 upstream of Chipps Island; reduced if Sac R. flows >80k cfs	X2 upstream of Chipps Island and mean delta-wide temps <18°C and south delta temps below 21.5°C	X2 upstream of Chipps Island and temps are below 21.5°C	X2 upstream of Chipps Island and temps are below 21.5°C
Spawning Stage as determined by FMWT, Bay Study, Spring Kodiak trawl and/or salvage (3)	Presence of Adults at spawning stage $\geq 4$	Presence of Adults at spawning stage $\geq 4$	Presence of Adults at spawning stage $\geq 4$					
smelt distribution (4)	See footnote #4	See footnote #4	See footnote #4	See footnote #4 or negative 20mm centroid	Negative 20mm centroid	Negative 20mm centroid	Negative 20mm centroid	Negative 20mm centroid
Salvage Trigger (5)	Adult or Spent Adult	Spent Adult or larvae	Spent Adult or larvae	If salvage is above zero	If salvage is above zero	If salvage is above zero	If salvage is above zero	

Tools for Change (6)	December	January	February	March	April	May	June	July
Export reduction at one or both facilities	X	X	X	X	X	X	X	X
Change in barrier operations						X	X	X
Change in San Joaquin River flows	X	X	X	X	X	X	X	X
Change position of cross channel gates	X	X	X			X	X	

Emergency Action to Add Section 749.3, Title 14, CCR,  
Re: Special Order Relating to Incidental Take of Longfin Smelt  
(*Spirinchus thaleichthys*) During Candidacy Period

## Longfin Smelt Risk Assessment Matrix Footnotes

- 1 The concern index refers to the Fall Midwater Trawl longfin smelt total index (all ages) from the 2-years previous to the calendar year of the larva/juvenile loss risk being evaluated (e.g., in 2008, the concern index would be FMWT 2006 and 2007 LFS indices; see <http://www.delta.dfg.ca.gov/data/mwt/>). The critical concern index of 240 is the approximate index value at the lower limit of the 1988-2000 outflow-abundance relationship (Figure 1). For recovery, indices at or above the regression line of the relationship are targeted.
- 2 We hypothesize that the location of X2 influences the distance adult fish migrate into the Delta to spawn and thus their vulnerability to entrainment in south delta exports, as well as that of their offspring. The highest and most consistent salvage of adult longfin smelt occurs when X2 is upstream of river kilometer (rkm) 70, and little salvage occurs when X2 is below 60 rkm. Sacramento River flow (3-day running average) of 80,000 cfs or greater pushes X2 well below rkm 70 and typically below rkm 60, moving water conditions suitable for longfin smelt spawning downstream of the Delta and transporting larvae downstream, away from the Delta as well. Longfin smelt spawn in winter when water temperature is declining into 13-15°C range. Larvae are typically present in colder temperatures and few early stage larvae continue to be present after water temperatures surpass 16.5°C. Young juveniles avoid temperatures > 21.5°C. These temperature relations were derived from plotting catches by stage on water temperature measurements, both of which were taken by the Bay Study field crews at western Delta locations, 1980-1986.

Critical thermal maxima for longfin smelt is unknown.

- 3 The adult spawning stage is determined from longfin smelt ( $\geq 85$  mm FL) captured by one of the trawl surveys and/or one of the salvage facilities. A stage greater than or equal to 4 indicates female longfin smelt are ripe and ready to spawn or have already spawned (following Mager 1996 for delta smelt).

Mager RC. 1996. Gametogenesis, Reproduction and Artificial Propagation of Delta Smelt, *Hypomesus transpacificus*. [Dissertation] Davis: University of California, Davis. 115 pages. Published.

- 4 Adults (December-February): the Fall Midwater Trawl in December, the Bay Study otter and midwater trawl samples in December through February, and the Spring Kodiak Trawl Survey in January and February all will provide data to be used to determine the distribution of adult longfin smelt. December-February trigger occurs when adult longfin smelt ( $\geq 85$  mm FL) are detected east or south of Jersey point in the San Joaquin River or south Delta channels however risk is substantially reduced when Sacramento River flows at Freeport surpass 80,000 cfs in a 3-day running average and remains low until total Delta outflow drops below 40,000 cfs for a 3-day running average; at which time the longfin smelt distribution will be re-evaluated relative to the original triggering criteria of an adult east or south of Jersey Point.

Larvae (January-April)(in 2008, March-April): March concern is triggered by the presence of longfin smelt larvae in salvage or distribution east or south of Jersey Point in the 20mm Survey. The level of response is determined by the distribution of larvae within the system (see <http://www.delta.dfg.ca.gov/data/20mm/> for longfin smelt)

Juveniles (March-July) – concern is triggered by longfin smelt juveniles distribution of juvenile smelt where the centroid is located upstream (negative) or downstream (positive) of the Sacramento-San Joaquin River confluence (see delta smelt Matrix, Figure 5.2). The 20-mm Survey centroid is calculated by multiplying the observed smelt station CPUE by a distance parameter in km from the confluence. The summed result (summed over a survey) is divided by the survey CPUE which gives the survey centroid position (see delta smelt Matrix, Figure 5.2 and <http://www.delta.dfg.ca.gov/data/20mm/> , selecting delta smelt).

- 5 Salvage trigger: the salvage trigger for December through March is determined by calculating the ratio of adult salvage to the fall MWT index. This ratio will increase as fish are salvaged during the winter months. If the ratio exceeds the median of what was observed during December-March 1980-2002, then the trigger was met (see Figure 6 for more explanation of the calculation)

During April, May and June, if longfin smelt collected at the salvage facilities is greater than zero, then the working group will meet. This is because April, May and June are the peak of smelt salvage and salvage densities cannot be predicted. Therefore, during these two months, the smelt working group will meet proactively to protect these fish by looking at relevant information such as salvage, delta temperatures, delta hydrology and smelt distributions.

- 6 The tools for change are actions that the working group can recommend to help protect longfin smelt. Exports may be reduced at one or both of the south delta export facilities and a proposed duration of the reduction would be recommended by the working group.